Support Factors That Influence Mothers' Decisions to Breastfeed Their Twins and Triplets Beyond 12 Months of Age

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Literature Review

Abstract

This study aims to determine support factors that influence women's decisions to breastfeed their multiples for over 12 months and characterize these particularly successful breastfeeding mothers, with the intention of informing breastfeeding promotion interventions. The World Health Organization recommends breastfeeding exclusively for 6 months. However, it is estimated that only 25% of twins and 15% of triplets still receive some human milk at 6 months, making multiples an important target for breastfeeding interventions. Data were collected via a self-administered online survey distributed internationally via La Leche League. Questions inquired about breastfeeding experience with each child and various types of support that influenced those experiences. All the women breastfed multiples for over 12 months. The majority were white, well educated (80% college degree), and 30 – 39 years old. Only 20% of respondents indicated that their child's primary care provider's recommendations were important/very important to their decision, and 12% indicated the same regarding their doctor's recommendations. Factors highly rated as important included nutritional value of breast milk, other health benefits of breastfeeding, establishing a strong bond, and mother and child enjoying breastfeeding. A majority of the sample felt their partner was important/very important to their decision. This relationship is the most highly rated as influential. Including the woman's partner could enhance educational opportunities designed to encourage mothers of multiples to breastfeed. Additionally, emphasis on health benefits of breastfeeding may encourage mothers to breastfeed longer. Further research to test breastfeeding interventions should be completed with these results in mind.

Background

The purpose of this systematic review is to answer the questions – what are the major obstacles for mothers of multiples in initiating and maintaining breastfeeding and what are the sources of support that are important? Additionally, where do the gaps in the literature lie, and what further steps are necessary for the establishment of clinical breastfeeding guidelines to support mothers of multiples? It is important to pursue research on breastfeeding multiple infants because evidence-based guidelines should be established in order to provide clinicians and parents with the information to make breastfeeding multiples less intimidating and more achievable. Though multiples do not make up a large proportion of deliveries, they are a growing proportion due to the increased use of assistive reproductive technologies. They also tend to have higher rates of breastfeeding initiation compared to singletons but tend to have shorter durations. With additional research on this topic, clinicians would be able to assist mothers of multiples in breastfeeding long-term.

The Centers for Disease Control and Prevention (CDC) produces a breastfeeding report card each year, which includes the prevalence of breastfeeding at various points in time post-delivery and strategies for working toward the national breastfeeding goals outlined in Healthy People 2020. In 2014, 79.2% of all US infants were breastfed post-delivery, but at 6 months the proportion drops to 49.4% still breastfeeding and then drops again to only 26.7% still breastfeeding at one year.[1] The CDC does not report specifically on multiples. However, it can be inferred from information provided in other studies that the breastfeeding initiation proportions are similar for singletons and multiples.[2] Though rates between studies vary, there

are generally high percentages of mothers who initiate breastfeeding multiples. Damato et al. (2005) found that 89.4% of 123 mothers with twins who were part of a national support group for mothers with twins initiated a milk supply via breastfeeding or expressing milk[3], but only 25% of twin infants and 15% of triplets were still receiving at least some human milk at 6 months, consistent with the national statistics noted previously, though the decrease with infant age is greater for multiples.[4] Other studies cite initiation rates of around 60 – 70%.[5–7] Damato et al. (2005) also noted that mothers of multiples breastfeeding at 1 month post-delivery were more likely to breastfeed at 6 months post-delivery, which indicates that "women who are able to persist with difficulties of establishing a milk supply" are also able to provide "a high percentage of infants' feeding as breast milk" in the early months.[3] A majority of the studies cited that include breastfeeding initiation rates gathered information from the Mothers of Supertwins Survey (MOST) or had a sample that was gathered from a national breastfeeding support group. Therefore, these rates may not be generalizable to all mothers of multiples. Overall, it appears that mothers with multiples tend to initiate breastfeeding at rates that match singletons but still fall short of meeting the goal of 81.9% outlined in Healthy People 2020.

Whether or not multiples can be breastfed exclusively is a question that is often raised. The national proportion for exclusive breastfeeding at 3 months is 40.7%, and at 6 months it is 18.8%.[1] Damato et al. (2005) includes information on the exclusivity of the breastfeeding by the women in their sample. One month after the expected delivery date, 61.8% of women were feeding using their breast milk exclusively or almost exclusively.[3] Almost exclusively was defined, as 81 – 99% of feedings with the mother's breast milk. At six months after the expected delivery date, 50% of women were feeding breast milk exclusively or almost exclusively.[3] The authors of the study conclude that breastfeeding exclusively at one month is predictive of

continuing to breastfeed at 6 months. There is no comment made about the possibility or impossibility of exclusively breastfeeding multiples. Several other studies emphasize that breast milk is on a supply and demand basis and, therefore, can provide exclusive nourishment for twins.[2,8,9] For higher order multiples (HOM), the question of exclusivity has a less certain answer. The physical challenge of breastfeeding 3 or more infants exclusively is often a barrier. Additionally, a mother's supply may not be able to keep up with that high demand if she is experiencing medical complications from the pregnancy or birth, finds that breastfeeding is too time consuming, or does not get adequate nutrition and rest. Mother's perception that her milk supply is inadequate also discourages exclusive breastfeeding.

Methods

Design. The PRISMA-P 2015 checklist was used to develop a protocol for this systematic review in order to guide the search process.

Setting. The review only utilized electronic databases for gathering sources of information and it was conducted via WorldCat, a service provided through Ohio State University, which searches several databases at once. These include Academic OneFile, Academic Search Complete, MasterFILE Complete, Newspaper Source Plus, OAIster, Oxford Scholarship Online, and WorldCat.org. Most articles used in this review came from Medline, PubMed, Wiley Online Library, and ScienceDirect. Search terms included breastfeeding multiples, breastfeeding multiple infants, breastfeeding twins, breastfeeding higher order multiples, support for breastfeeding multiples, difficulty breastfeeding multiples, singletons versus multiples breastfeeding, and human milk expression for multiple infants.

Sample. There were a total of 43 articles, reports, and informative guides used in this review. All study designs and article formats were included in order to provide a review of basic

knowledge regarding breastfeeding multiples, gathered from informative guides and case reports, and any clinical studies available.

Measurement. Articles could be published in any country worldwide. The study or discussion topic of the article was required to be specific to breastfeeding multiples. Studies that were not published in English and articles published before 1990 were excluded. Additionally, any article in which the discussion topic focused on the complications related to preterm birth with only a mention of breastfeeding was excluded. Studies whose sample was mainly singletons with less than 5 sets of multiples were excluded on the basis that valid conclusions about multiples could not be drawn from such an analysis. All materials whose main purpose was parent education were also excluded.

Results

Evidence applicable to singletons and multiples. Some variables that have been reported to affect breastfeeding duration for singletons and multiples include maternal age and health status, race, marital status, education level, household income, delivery method, receipt of free formula, self-efficacy, and working for more than 20 hours per week at 6 months post-delivery.[9–13] For singletons, older women who are Caucasian and have completed higher education tend to be the group who is most likely to initiate breastfeeding.[3] These demographic characteristics have been found to predict breastfeeding of multiples as well.[3,8] There are many articles that discuss the social, cultural and medical factors that influence breastfeeding of singletons. For example, the impact of race on exclusive breastfeeding,[14] negative community reaction to breastfeeding,[15,16] influence of diet on breastfeeding,[17] and how employment can affect breastfeeding are common study topics.[12] There are no identified studies that focus specifically on the influences of diet, employment, post-partum depression, birth complications,

and many other factors for multiple infant breastfeeding. Most randomized trials use singleton populations to investigate factors that influence breastfeeding. There is a lack of information specific to multiples for many issues that are known to influence breastfeeding among singletons.

Depending on maternal preference and singleton versus multiple births, breastfeeding can be seen as time consuming and stressful or easy and time-saving.[18,19] Yokoyama et al. (2004) found a difference in maternal feelings regarding singleton or multiple pregnancy; mothers expecting multiples were more likely to experience anxiety related to the pregnancy.[20] It can be concluded that multiple pregnancy is more stress inducing, therefore mothers may have to overcome additional obstacles, beyond those of singleton mothers, to breastfeed their infants.

There have only been a few empirical studies that directly compared singleton and multiple breastfeeding patterns. Geraghty et al. (2005) examined the human milk expressing rates of mothers of singletons and multiples.[2] Their sample included 358 women who gave birth in 7 counties in Ohio or northern Kentucky in the area around Cincinnati Children's Hospital in 1999. In addition to public domain information provided by the Child Policy Research Center, the women were contacted when their children were 2 or 3 years old and asked to complete a self-administered survey and a phone interview. Their hypothesis was that the mothers of multiples would be more likely to express milk. However, the results found that between mothers of preterm singletons, term singletons, preterm multiples, and term multiples there were no significant differences in the percentage of women who reported pumping at least once during the first six months after birth.[2] An article written using the same dataset found that preterm multiples were provided with human milk less often than the other three groups at every time period studied, with term singletons maintaining the highest rate of 56% exclusively breastfed at 2 weeks postpartum.[9] In support of previous conclusions, Yokoyama et al. (2006) found that the

rate of “exclusive breastfeeding among twins or triplets was significantly lower than among singleton babies.”[21]

Not only are there differences between singleton and multiple births, but there are also differences between twins and HOMs. In the MOST survey, 77% of a sample of 52 mothers of quintuplets provided some human milk for an average of 13.5 weeks.[7] HOMs rates are similar to breastfeeding initiation rates of twins,[5] but it may take more motivation and perseverance for mothers of HOMs to begin and maintain milk supply. Szucs et al. (2009) reported a case study about a mother with quintuplets who had to overcome many obstacles, such as lack of nurse support and insurance coverage for donated human milk, but she was able to exclusively feed her infants human milk for 7 months.[7] The only major difference between mothers of twins and mothers of HOMs is the amount of breastfeeding or expressing that occurs throughout the day. A mother of quadruplets may breastfeed 12 – 34 times per day,[22] a set of triplets may feed 18 – 27 times per day[23] and twins may be fed closer to 8 – 12 times each.[5] Research has found that mothers of triplets and quadruplets are able to provide nutrition sufficient for appropriate infant growth.[6,22,23] Despite the milk produced being equal to the demands of HOMs, mothers have to employ different tactics to feed all the infants; this may include bottle-feeding one infant with expressed milk or formula, breastfeeding simultaneously and then offering the third infant both breasts, etc. The difficulty of breastfeeding HOMs, including the time commitment and practical methods needed, can further hinder mothers in achieving their breastfeeding goals.

Obstacles to Breastfeeding Multiples. Studies on breastfeeding singletons cite “perception of inadequate milk supply, sore nipples, leaking breasts, and the need for frequent feedings” as major reasons women discontinue breastfeeding.[3,24] Several studies note that although these challenges may influence mothers of multiples, they are faced with unique

circumstances that they have to overcome to maintain breastfeeding. There are several key obstacles associated with breastfeeding multiples which include preterm birth complications, length of hospital stay, maternal demographics and health status, delayed lactogenesis and perception of inadequate milk supply, insufficient resources and lack of prenatal, in-hospital, and postnatal education, and deficient support from partner, family or health providers.

Around 40% of twins and 90% of triplets are born both preterm and low birth weight[19] and therefore are more likely to be fed expressed milk or formula exclusively, at least initially.[2] In general, preterm babies have more trouble with breastfeeding due to immature gastrointestinal and neurological function, poor sucking ability, and lack of coordination of breathing and swallowing.[25] Therefore, breastfeeding on an on-demand basis may be hard for preterm infants who are unable to self-regulate their sleep, wakefulness and response to hunger.[19,26] Mothers of multiples who persevere through the initial breastfeeding challenges often find that the turning point when breastfeeding became manageable was related to the physical maturity of the infant.[26]

Additionally, length of hospital stay tends to be longer for preterm infants. This is important to note because Kirchner et al. (2009) found that the longer the infants are in the hospital, the shorter the duration of breastfeeding.[27] The timing of discharge is important as well. Staggered discharge is associated with difficulties maintaining breastfeeding.[5,9] The mother will have to coordinate care of the infants at home, her expressing schedule, and going to the hospital to feed and care for the infant(s) remaining there; this is a major barrier for mothers of multiples who are already fatigued and potentially experiencing health problems.[22]

The mother's demographic characteristics and maternal health issues are also associated with poorer breastfeeding outcomes. Population-based research on multiple births has found that smoking, lower education level and younger maternal age are associated with early cessation.[13,28]

Östlund et al. (2009) found that smoking at first antenatal care visit and lower education level were associated with cessation of breastfeeding by 6 months of age.[11] Stress is believed to interfere with lactation[29] and mastitis or other breast complications may occur. It is also important to monitor the mother's mental health status in addition to their physical condition. Depression may be associated with early cessation of breastfeeding[3] and higher levels of anxiety are associated with infants being bottle-fed.[20,30] Maternal medical complications, both emotional and physical, can have a negative impact on duration of breastfeeding and potentially compromise milk supply.[8,31]

The amount of breast milk that mothers can produce is on a supply and demand basis.[2,3,22,30] Mothers of singletons tend to produce 600 – 800 mL per day of human milk, while mothers of twins and triplets can produce between 1 – 2 L per day during the first several months.[5] A key to maintaining breastfeeding is to work on establishing an adequate milk supply early in order to promote maternal confidence. Women who push through initial problems associated with breastfeeding twins and HOMs can supply enough milk for all their infants.[3,31] Several case studies on triplets, quadruplets and quintuplets indicate that the mother was able to breastfeed all her infants if she chose to and barriers were low, with the quintuplets only getting supplemented with donated human milk and other mothers supplementing with formula or expressed milk in accordance with their goals.[6,7,22,23] Despite research indicating that milk supply can be sufficient, one of the greatest barriers to breastfeeding multiples is that women feel their supply of milk is not enough to meet the infants' nutritional needs.[23,32] A mother's worry about her milk supply may be "reinforced by negative perceptions of mother's significant support person and health care providers."[8] Additionally, Leonard's (2000) case study on breastfeeding triplets found that "presence of family assistance didn't always result in increased

breastfeeding."[23] Fear that the infants are not being fed enough and lack of support may cause women to supplement feedings with formula, which can lessen milk supply if they decrease the proportion of human milk feedings. A study in Japan found that multiples are 2.44 times more likely to be formula-fed, even though an established milk supply can nourish multiples.[21]

As mentioned previously, having a non-cooperative partner can be an obstacle to breastfeeding and is associated with bottle-feeding.[21] It has been suggested that "the father's role and support may be even more important" with multiples than with singletons.[11] There were no identified articles that specifically studied the father's role in breastfeeding initiation or duration for multiples. In singletons, 80% of women surveyed by Arora et al. (2000) said that support from the father would have encouraged breastfeeding.[33] Lack of provider support, family support and support after discharge can all impact the duration of breastfeeding for singletons, they likely do for multiples as well.[34–36] Additionally, women often report that health care providers give insufficient education specific to breastfeeding multiples and women receive inconsistent advice while in the hospital about how to feed their infants.[23,32]

Support for Breastfeeding Multiples. Providing optimal support for breastfeeding multiples starts during pregnancy, should be intensive during the hospital stay, and must continue after discharge in order to maximize effectiveness. Maternal motivation is cited as one of the most crucial elements of persevering through challenges and maintaining breastfeeding for longer durations.[3,6,22] In order to gauge the mother's motivation to breastfeed, prenatal education should be provided on the facts and strategies of multiples breastfeeding and goals should be outlined before the delivery. Prenatal education will be followed up by in-hospital support and then post discharge care, which are all key elements of successful multiples breastfeeding.[18,27,30,32,37]

A health provider, such as a clinical nurse specialist or lactation consultant, should guide the mother in establishing manageable, flexible goals and altering her plan as the infants progress.[6,29] A chart to record daily feeding information is helpful to track progress, identify any issues, and reassure mother of appropriate infant behavior.[5,38] Overall, the chart, goals and plans for multiple birth infants should "be flexible, reflect maternal goals and preferences, be modified as necessary, and address the needs of the mother, each infant, and the family unit."[19]

In order to support initiating breastfeeding, it is important to place the infant at the breast as early as possible, whether that is skin-to-skin contact following delivery or attempting a feeding.[1,2] Expressing shortly after the delivery may be necessary if the infants are in a precarious medical situation. Either way, stimulation is needed to start the flow of milk. The earlier this is done, the more likely the mother is to maintain breastfeeding.[2,10,23,39]

Physician support can play an important role in breastfeeding. They should be involved in educating the mother, establishing goals, and initiating breastfeeding.[10] Szucs et al. (2009) conducted a case study on quintuplets, in which the mother said she felt encouraged by her neonatologist and that encouragement inspired all the other providers she interacted with in the NICU to support her plan as well.[7] Having a consistent hospital staff member, such as a physician or lactation consultant, who works with the mother in the hospital and following discharge, can help maintain breastfeeding.[6,19,22,28,30,40] This is supported by the case study conducted by Auer et al. (1994) in which a clinical nurse specialist made herself present at a majority of the feedings and helped mobilize all the other staff nurses to increase their support for the mother.[6] The mother cited this support, which continued after discharge, as the major reason she gained the confidence to continue breastfeeding.[6]

Not only does staff support help, but the setup of the hospital to promote mother-infant interaction can increase breastfeeding duration.[1] New initiatives identified in the Breastfeeding Report Card of 2014 discuss having Baby-Friendly designated hospitals to promote rooming in and skin-to-skin contact, which help to establish milk supply and promote long-term breastfeeding.[1,11,28,29] Kavanaugh et al. (1995) found that "research-based support services in the NICU have been demonstrated to be effective in preventing in-hospital breastfeeding failure."[26] Kirchner et al. (2009) states that breastfeeding rates can be increased by "intensive encouragement and by giving active support to mothers during neonatal care."[27] Recent work has confirmed that hospitalized infants much more immature and medical fragile than previously thought can participate in skin-to-skin contact and various strategies aimed at encouraging oral feeds.[41]

There are also a variety of supportive factors that come into play after discharge from the hospital. It is essential for the family to secure regular help and support for an extended period of time after discharge.[5,7,23] Along with help, it is also important that the mother feels she has control over her time and her infants' care in order to increase her self-efficacy.[28] Within the home, test weighing can be used to reassure the mother that her milk is providing the infants with enough nutrition and that they are gaining weight appropriately.[5,26,28] This reassurance is especially important for mothers of preterm multiples, who tend to seek "more objective and immediate feedback" that infants' nutritional needs are being met.[26] Reassurance from medical checkups should be provided by a lactation consultant or other medical professional who supports the family during their transition from the hospital to their home.[5,10,23,30] Continuation of care and establishment of a regular support system, as well as someone who is available to ask questions and voice concerns to, can increase maternal confidence. Despite the obstacles these

mothers may face, Liang et al. (1997) concluded that when provided with an established program, experienced staff, and sufficient support, rate of successful breastfeeding in singletons and multiples is not significantly different.[25]

Factors with Mixed Results. The aforementioned obstacles and supports have been fairly well researched specific to multiples. There are several factors that have produced mixed results in the literature. McGovern (2014), who conducted a study with three mothers of twins, found that previous breastfeeding experience might be important.[42] However there is mixed research on whether being primiparous or multiparous is more advantageous when a mother has multiples.[13] Östlund et al. (2009) found that term twins were breastfed longer if the mother was multiparous.[11] This confirms prior research on the impact of parity in singletons and multiples[21] but is also contrary to other studies.[27] One possible explanation for the contention is that multiparity is not beneficial if the multiples are preterm.[11,13]

Low birth weight may also influence breastfeeding. Women who ceased breastfeeding at 1 month postpartum often had one twin with a lower birth weight[8] and Yokoyama et al. (2006) found that the "birth weight of infants of mothers who chose bottle-feeding was significantly lower than that of infants of mothers who chose exclusive breastfeeding or mixed-feeding."[21] However, this variable is not always identified as influential on breastfeeding, for example in a study on premature infants by Kirchner et al. (2009).[27]

Though only mentioned in passing, it is possible that deconditioning as a result of bed rest during a high-risk pregnancy may impact milk production.[8] There were no studies that focused specifically on this variable, but it could be included under the influence of mother health status. Yokoyama et al. (2006) found that there was a significantly higher rate of mothers with poor health status who choose to bottle-feed, even compared to mixed-feeding.[21]

There has been some research done about the impact of pacifier use on breastfeeding duration with twins and HOMs.[10,18] Some say that it shortens the breastfeeding duration and may cause nipple confusion.[10,18] But others find that it can promote non-nutritive sucking skills in preterm infants, which can decrease the time it takes for twins to successfully nipple feed.[25] Nipple shields have also been mentioned to cause nipple confusion but some research has found that they do not shorten the duration of breastfeeding in premature infants.[31]

Support from national and local multiples families clubs or organizations is cited as both positive and negative.[42] McGovern found that the three mothers of twins she interviewed in New Zealand felt it was very valuable to talk to other mothers of twins about their breastfeeding experience.[42] However, some have stated that they were discouraged by women in their local groups because other women did not believe it was possible to breastfeed HOMs.[22] Leonard (2000) found that women of triplets tend to prefer to talk with and get support from other mothers of triplets, as opposed to mothers of twins and she cited that the results were mixed on the helpfulness of support groups.[23] The mixed results may be based on differences in number of infants the women in the group have and the personal opinions of the women present, which could be either encouraging or harmful.

Discussion

Limitations of Current Research. Research focused on the breastfeeding of multiple infants is a relatively new addition to the literature, especially since 2000. Multiple births are less common than singleton births and this can present sample size issues for clinical studies. It should be noted that the studies included in this review have sample sizes ranging from 10 to 1,787, with only 3 having a sample that exceeds 200. Due to these articles typically having a small and often convenience sample of multiples, the results may not be generalizable.

Additionally, too few empirical studies exist to provide adequate evidence to inform practical guidelines. More recent articles identify that there is an increasing awareness of the importance of creating said guidelines, but there has not been an attempt, via controlled studies with adequate sample sizes, to fill in the knowledge gaps necessary to create evidence-based recommendations on how to breastfeed multiple infants.

Research Gaps and Impact on Development of Guidelines. It is often mentioned in the literature that there are gaps in our knowledge of breastfeeding multiples, a lack of research-based guidelines, and inconsistent advice given to these mothers regarding initiating and maintaining breastfeeding.[3,4,6,9,11,18,21–23,26,31,40,43] For example, it was common practice to recommend that the mother assign a breast to each infant for feeding. However, it is known that alternating breasts can help to maintain and increase milk supply depending on the feeding patterns of the infants.[18,38,43] Cinar et al. (2013) conducted a study in Turkey in which all ten mothers received this advice and then discontinued the practice when they were discharged because it was incompatible with the reality of their breastfeeding twins.[18] Not only are mothers of multiples left confused upon receiving unhelpful advice and mention wanting better in-hospital educational support,[18,23] but nurses also feel that they would like in-services on breastfeeding multiples so they can better inform families.[18] Another important example is the protocol in some NICUs is to establish bottle-feeding and then transition the infant to the breast.[31] However, to the extent infants are medically stable enough, “infants remain more physiologically stable during” breastfeeding and it allows them better control over the flow of milk.[31] In a preterm infant this is essential because it helps them learn to coordinate sucking, breathing, and swallowing. Mothers who wish to breastfeed should not have this delayed just to establish bottle-feeding first because that is not a research-based requirement for the

development of preterm infant feeding. The discrepancy between provider advice and research emphasizes the need to create guidelines that are not based on opinion or common practice. Currently, the most important objectives for research are to identify the greatest obstacles to initiating and maintaining breastfeeding of multiples and then establish early interventions to give the mothers the best chance of completing their breastfeeding goals.[3,4,8,9]

Conclusion

This systematic review of literature regarding breastfeeding multiples has synthesized material from relevant articles in order to compile information about the obstacles and supports that influence a mother breastfeeding her set of multiples. This review can serve as a basis for the development of a study whose aim is to gather evidence and create guidelines for breastfeeding multiples. The current literature on breastfeeding multiples, which comes together in this review, provides an adequate base for establishing and testing guidelines. The importance of this future task should be emphasized because it is clear through CDC recommendations that maintaining breastfeeding is important for infant health. The unique population of twins and HOMs requires more extensive research in order to provide evidence-based support for mothers and help them breastfeed at rates comparable to singletons. Providing the parents of sets of multiples with reliable information will allow them to set and follow their own breastfeeding goals and provide their children with a healthy start through maintained breastfeeding.

Support Factors that Influence Mothers' Decisions to Breastfeed Twins and Triplets for at least 12 Months

Introduction

In the United States, the total number of registered births was 3,988,076 in 2014.[1] Of this number, there were 135,336 twins, 4,233 triplets, 246 quadruplets, and 47 quintuplets or higher-order multiples (HOMs).[44] The multiples birth rate is up 1% from 2013, though it is lower than the peak years of 2006 – 2009.[45] In 2014, 79.2% of all US infants were breastfed post-delivery, but at 6 months the proportion drops to 49.4% and then drops again to only 26.7% at one year.[1] While these rates are an improvement compared to the last several years, there is still concern about maintaining breastfeeding for the duration recommended by the World Health Organization (WHO). Infant nutrition guidelines from WHO state that exclusive breastfeeding is recommended until the infant is 6 months old and should be continued up to 2 years of age with the proper supplemental foods.[46] Initiation rates for multiples are close to that of singletons, with around 70% or more mothers of multiples beginning breastfeeding, however at 6 months only around 25% of twins and 15% of triplets receive breast milk.[4] These rates are not up to the standards set by WHO nor do they meet the goals outlined in Healthy People 2020. While having multiple infants poses a unique challenge to breastfeeding, "virtually all mothers can breastfeed, provided they have accurate information, and the support of their family, the health care system and society at large."[46] This statement may seem obvious, but mothers of multiples often do not receive adequate support and education.

Current research has only just started to recognize the need for empirical information to establish breastfeeding guidelines for mothers of multiples. Several papers have been written regarding a cohort of women who gave birth in 1999 at Cincinnati Children's Hospital Medical

Center. The authors compared pumping rates and human milk feeding rates between mothers of multiples and mothers of singletons.[2,4,9] They found no difference in the percentage of mothers who pumped based on multiple gestation or length of pregnancy,[2] although premature multiples were provided with human milk less often than term multiples, preterm singletons, and term singletons.[9] They concluded that are more barriers to breastfeeding for premature multiples due to factors such as inability to nurse at the breast initially, staggered discharge, etc.[9] Despite issues surrounding prematurity, mothers of multiples did not appear to make discrepant feeding choices in the first 6 months.[4] Other studies have researched the duration and reasons for cessation of breastfeeding multiples.[3,8] In a cohort of 123 women who were all part of an national support group for mothers of twins, Damato et al. (2005) found that 89.4% of these women initiated breastfeeding or a milk supply via pumping.[3] This paper concluded that it is important to establish a milk supply early and by pushing through the initial difficulties, they will be able to provide a high percentage of breast milk feedings.[3] The papers based on this cohort identified barriers that may affect breastfeeding multiples and emphasized the importance of providing early intervention to extend the duration of breastfeeding.[3,8] In a population-based study conducted by Ostlund et al. (2009), they found that education level of upper secondary school or less, lower maternal age, and smoking at the first antenatal visit were all associated with cessation of breastfeeding before 6 months. A study by Yokoyama et al. (2004) concluded that a mother's decision to bottle-feed was significantly associated with non-cooperation of the husband and degree of anxiety mothers felt about multiple pregnancy.[20] Not surprisingly, mothers with multiples have additional barriers to overcome compared to mothers of singletons.[9,21,25] Many articles suggest that early intervention and support, both from medical professionals, the woman's partner, and other significant persons, are important for completing

the mother's breastfeeding goals.[2,3,6,7,20,22,28,30,40] There is a clear call for establishing evidence-based guidelines for mothers of multiples in order to support initiation and maintenance of breastfeeding.

This study aims to determine the specific characteristics of mothers of multiples who have been able to breastfeed for over a year and identify the support factors that were most helpful to their experience. The first objective of this study is to identify the demographic characteristics of women who breastfed multiples for more than a year. Then, the goal is to determine what factors these women found most important in supporting their breastfeeding and how those factors are related to demographics. The third question addressed is whom the women discussed their decision to breastfeed with and if they chose not to talk with someone, what was the reason? Overall, the results of this study hope to inform guidelines that can be used to educate providers and mothers of multiples, thus decreasing confusion and difficulty associated with breastfeeding multiples and increasing the rates of initiation and maintenance of breastfeeding.

Materials and Methods

"Breastfeeding Beyond One Year of Age" is a self-administered questionnaire that was created using Survey Monkey. Through the La Leche League (LLL), a prominent international breastfeeding group, the survey was distributed in 2013 via email, online support groups, list-serves and various social media platforms. The LLL's connections lead to widespread data collection around the world. The main countries involved were the Unites States, Canada and the UK. The survey included questions on demographics (maternal age, education level, etc.), various types of support the women received (spouse, family, friends, and several types of

physicians) and how the support affected the conversations the women had about breastfeeding. Additionally, respondents were asked to report on breastfeeding circumstances for each child and rate a list of factors that were of importance to their continued breastfeeding. In order to qualify for this analysis, a woman had to have breastfed at least two babies in a set of multiples for at least 12 months. Women were not eliminated if they breastfed one baby longer than the other, as long as the shortest duration was at least 12 months. If a woman had an infant die in a set of triplets but breastfed her other two infants for at least 12 months, she was also included. All women who indicated that they had a twin die in utero were not eligible. Irish twins are also excluded from this study. The mothers in the sample who had twins but did not breastfeed over 12 months were excluded even if they had breastfed a singleton for at least 12 months. The total sample used includes 1,173 women who had multiples they breastfed for beyond 12 months.

Data Analysis

Data was managed and analyzed using STATA 14. In order to determine the demographic characteristics of the sample, percentages and sample size (n) were tabulated (Table 1). The main focus of this analysis is the support that women received and how that impacted their decision to breastfeed for over 12 months. The survey question “Rate the importance of the following factors in your decision to breastfeed beyond 12 months of age” was used to determine which support factors are typically ranked highest for mothers of multiples (Table 2). Chi-square tests were done to see if any demographic characteristics were correlated with support factors (Table 3). Additionally, the survey asked a series of questions regarding the mother’s interaction with her child’s primary care provider, the healthcare provider for pregnancy and delivery, her own general healthcare provider, her mother, her closest friend and her partner and if she discussed her decision to breastfeed beyond 12 months with them. For the

remainder of the analysis, the total sample used was 699 because the support questions were only asked regarding the oldest child the women breastfed for 12 months. Thus, women whose oldest child breastfed for 12 months was not a multiple were excluded from the support factor analysis. The sample size and percentages for the question, “Did you discuss your decision to breastfeed beyond 12 months with…?” were tabulated. Log binomial regression was used to calculate the relative risk and confidence interval for each potential source of support and each demographic variable (Table 4). Log binomial regression was used because outcomes were not rare and allowed estimation of relative risks. However for partner support, logistic regression was used to calculate an odds ratio and confidence interval because the log binomial model failed to converge. For women who choose not to discussion their decision with the child’s general practitioner, the obstetrician or her own general practitioner, the survey asked why they choose to not discuss (Table 5).

Results

Table 1 Maternal Demographics of Women who Breastfed Multiples for Over 12 Months (2016, n=1,173)

Demographic		n	Percent
Maternal age			
	18 – 29 years	144	14.5%
	30 – 39 years	620	62.7%
	40 – 50 years	225	22.8%
Highest level of education	High school or some college	198	20.0%
	Associate's degree	103	10.4%
	Bachelor's degree	350	35.3%
	Master's degree	242	24.4%
	Professional or Doctorate degree	98	9.9%
Country of Residence	United States	800	80.6%
	Europe	65	6.6%
	Canada	63	6.4%
	Other	64	6.5%
Ethnicity			
	Not Hispanic or Latino	945	95.6%
	Hispanic or Latino	44	4.4%
Race			
	White	920	93.0%
	Other	69	7.0%
Number of children			
	2	405	34.5%
	3	435	37.1%
	4	192	16.4%
	5 or more	141	12.0%
Number of children breastfed for over 12 months	2	557	47.5%
	3	420	35.8%
	4 or more	196	16.7%

Notes: Percentages may not add to 100 due to rounding
Missing data: 184 maternal age, 182 highest level of education, 181 living in US/ outside of US, 184 ethnicity, 184 race

Demographics of Women who Breastfed Multiples for Over 12 Months

Table 1 provides the demographic characteristics for this sample of women who had multiples they breastfed for over 12 months. 62.7% of the women in this sample were between the ages of 30 – 39 and 80% of the women had achieved some type of college degree, ranging from an Associate's to a Doctorate or Professional degree, with a majority holding a Bachelor's. Majority of the sample was collected in the United States and were white, non-Hispanic women. Most of the women in the sample had two or three children and most breastfed two or three infants for more than 12 months.

Table 2 Factors that Influenced Mothers with Multiples' Decision to Breastfeed for Over 12 Months (2016, n=1,173)

	Not Important/ Somewhat Important	**Important/ Very Important**	**Not Applicable**
Child's primary care provider's recommendation	461 47.3%	200 20.5%	313 32.1%
Mother's doctor's recommendation	483 49.6%	120 12.3%	371 38.1%
Spouse, partner, or significant other's support	230 23.6%	688 70.6%	56 5.7%
Family members' recommendations	586 60.2%	249 25.6%	139 14.3%
Friends' recommendations	614 63.0%	245 25.2%	115 11.8%
Ethnic background and/ or cultural beliefs	446 45.8%	155 16.0%	373 38.3%
Breastfeeding is cheaper than buying formula	393 40.3%	516 53.3%	65 6.7%
Nutritional value of breast milk	12 1.2%	959 98.5%	3 0.3%
Other health benefits	16 1.6%	956 98.2%	2 0.2%
Building a strong bond with the child	20 2.1%	951 97.6%	3 0.3%
Mother enjoys breastfeeding	117 12.0%	845 86.8%	12 1.2%
Child enjoys breastfeeding	32 3.3%	938 96.3%	4 0.4%
Child refuses to drink from bottle or cup	392 40.0%	200 20.5%	382 39.2%

Notes: Percentages may not add up to 100 because of rounding
Missing data: 199 responses

Factors that Influenced Mothers with Multiples' Decision to Breastfeed for Over 12 Months

Table 2 provides information regarding various factors that women ranked as either not important/somewhat important or important/very important in their decision to breastfeed over 12 months. Only 47.3% percent of women identified that their child's primary care doctor recommendations were not important/somewhat important, and 49.6% indicated that their doctor's recommendations were not important/ somewhat important. Around 60% of women felt that family members' and/or friends' recommendations were not important/somewhat important. Although doctors, family, and friends were not typically ranked as important in the breastfeeding decision, 70.6% said that partner support was important or very important. In addition to partner support, nutritional value of breast milk and the other health benefits that can be gained from breastfeeding were indicated as important/very important by over 98% of the women. Creating a strong bond with the child and the child enjoying breastfeeding were each ranked as important/very important by around 97% of the women. Eighty-seven percent of mothers indicated that their own enjoyment of breastfeeding was important/very important in their decision to continue for over 12 months.

Table 3 P-values from Chi-Square and Fisher's Exact Tests to Determine Associations between Demographic Characteristics and Factors that Influenced the Decision to Breastfeed Multiples for Over 12 Months (2016, n=1,173)

Mothers either indicated that the following factors were not important/somewhat important or important/very important	**Mother's age at the time of survey**	**Mother's highest level of education**	**Country of residence**	**Hispanic**	**Race**	**Total number of children**	**Total number of children breastfed over 12 months**
Child's primary care provider's recommendation	0.79	0.85	0.70	0.77	0.31	0.91	0.31
Mother's doctor's recommendation	0.50	0.65	0.97	0.28	0.13	0.78	0.69
Spouse, partner, or significant other's support	0.06	0.57	0.42	**0.04**	0.32	**0.05**	0.19
Family members' recommendations	0.16	0.55	0.54	0.28	0.93	0.28	0.14
Friends' recommendations	0.55	0.10	0.49	0.75	0.29	0.57	0.33
Ethnic background and/ or cultural beliefs	0.62	0.16	0.08	0.24	0.70	0.37	0.19
Breastfeeding is cheaper than buying formula	**<0.01**	**0.01**	0.42	**0.02**	**<0.01**	**0.04**	0.37
Nutritional value of breast milk	**<0.01**[a]	0.09[a]	0.70[a]	0.51[a]	1.00[a]	0.17	0.41
Other health benefits	**<0.01**[a]	0.06	0.99[a]	0.77[a]	0.47[a]	**0.05**	0.21
Building a strong bond with child	0.29[a]	0.13[a]	0.78[a]	0.61[a]	1.00[a]	0.83[a]	0.47[a]
Mother enjoys breastfeeding	0.33	0.11	0.65	0.47[a]	0.22	**<0.01**	**<0.01**
Child enjoys breastfeeding	1.00[a]	0.58[a]	0.37[a]	0.40[a]	0.27[a]	1.00[a]	0.49[a]
Child refuses to drink from bottle or cup	0.97	0.24	0.45	**0.04**	0.34	0.73	0.48

The percentages listed in the following section are the percentage of women in each category who ranked the support factor as important/ very important. Example: 76% of non-Hispanic women ranked partner support as important/ very important

The questionable results for nutritional value and other health benefits have been resolved. The percentages I copied into this table were from only a select part of the sample. The correct ones (which match what I used for the chi-square) were only slightly different but enough that the results make more sense.

Spouse, partner, or significant other's support	**Ethnicity**		**Number of children**							
	Non- Hispanic	74.3%	Two children	78.7%						
	Hispanic	88.1%	Three children	72.9%						
			Four children	68.8%						
			Five or more children	80.4%						
Breastfeeding is cheaper than buying formula	**Maternal age**		**Education level**		**Ethnicity**		**Race**		**Number of children**	
	18 – 29 years	67.2%	High school or some college	63.9%	Non-Hispanic	55.9%	White	55.4%	Two children	50.3%
	30 – 39 years	58.1%	Associate's degree	63.4%	Hispanic	74.4%	Other	74.6%	Three children	59.5%
	40 – 50 years	45.7%	Bachelor's degree	57.9%					Four children	60.1%
			Master's degree	51.8%					Five or more children	62.0%
			Professional or doctorate degree	42.4%						
Nutritional value of breast milk	**Maternal age**									
	18 – 29 years	100%								
	30 – 39 years	93.3%								
	40 – 50 years	93.7%								
Other health benefits	**Maternal age**		**Number of children**							
	18 – 29 years	99.3%	Two children	95.5%						
	30 – 39 years	90.6%	Three children	91.5%						
	40 – 50 years	93.2%	Four children	90.9%						
			Five or more children	88.6%						
Mother enjoys breastfeeding	**Number of children**		**Number of children breastfed for over 12 months**							
	Two children	82.5%								
	Three children	89.4%	Two children	84.4%						
	Four children	91.6%	Three children	90.2%						
	Five or more children	93.3%	Four or more children	92.1%						
Child refuses to drink from a bottle or cup	**Ethnicity**									
	Non-Hispanic	32.9%								
	Hispanic	51.9%								

Notes: [a] p-values presented are from Fisher's Exact Test. All values bolded are "significant," with a p-value being less than 0.05.
Missing data: 199 response

Chi-Square and Fisher's Exact Test Results to Determine Associations between Demographic Characteristics and Factors that Influenced the Decision to Breastfeed Multiples for over 12 months

Maternal age at the time of the survey was found to be associated with three influencing factors. The older the women were, the less and less likely they were to indicate that breastfeeding being cheaper than formula was important to their decision to breastfeed over 12 months (p=<0.01). 100% of the youngest and 93% of the oldest groups of women indicated that the nutritional value of breast milk was important to their decision and women in the age ranges of 30 – 39 had around 98% indicate the importance of nutritional value (p=<0.01). Similarly, 90% of the middle age group and 93% of the older group indicated that other health benefits associated with breastfeeding were important in their decision, compared to 99% of the other two groups (p=<0.01). There were no other associations found between a mother's age and factors that influenced her decision.

As mother's education level increased, breastfeeding being cheaper than formula decreased in importance (p=<0.01). No other associations were found between mother's education level and the various decision-making factors. Additionally, there were no associations between country of residence and any of the factors included in the survey.

Hispanic mothers were more likely than non-Hispanic mothers to indicate that partner support, the fact that breastfeeding is cheaper than formula, and their child refusing to rink from a cup were important influences (88%vs.74%, 74%vs.56%, 52%vs.33% respectively). Most women, 55% of white women and 75% of non-white women, indicated that breastfeeding being cheaper than formula was important in their decision to breastfeed for more than 12 months (p=<0.01).

There were no other associations found between ethnicity or race and factors associated with the mother's decision to breastfeed for more than 12 months.

The importance of partner support increased as the number of children did, expect for the 3 children category ($p=0.05$). Women with more children were increasingly likely to say that breastfeeding being cheaper was important in their decision to breastfeed for over 12 months ($p=0.04$).

The more children a woman had the more likely she was to feel that her enjoyment of breastfeeding was important to her decision to breastfeed for over 12 months ($p=<0.01$). The same association was found with the number of children a woman breastfed over 12 months ($p=<0.01$). Women with fewer children were more likely to feel that other health benefits associated with breastfeeding are important ($p=0.05$). There were no additional associations found for the total number of children or total number of children breastfed beyond 12 months.

Table 4 Log Binomial Regression/ Logistic Regression to Assess the Relationship between Demographics and Discussion of the Decision to Breastfeed Over 12 Months with Various Sources of Support (2016, n=699)

	Child's healthcare provider		**Healthcare provider for pregnancy and delivery**		**Primary provider of mother's general healthcare**		**Mother**		**Closest friend**		**Partner**	
I discussed my decision to breastfeed with this person	253 43.6%		147 25.6%		125 23.3%		395 70.8%		384 69.8%		530 92.2%	
I did not discuss my decision to breastfeed with this person	327 56.4%		427 74.4%		411 76.7%		163 29.2%		166 30.2%		45 7.8%	
	RR	CI	RR	CI	RR	CI	RR	CI	RR	CI	OR	CI
Maternal Age (at the time of survey completion) 18-29 (ref)												
30-39	1.06	0.80-1.40	0.81	0.55-1.17	1.29	0.77-2.17	0.93	0.82-1.05	**0.86**	**0.76-0.97**	0.57	0.19-1.68
40-50	1.12	0.81-1.55	0.90	0.58-1.40	**1.80**	**1.03-3.13**	**0.71**	**0.58-0.86**	0.86	0.73-1.02	**0.29**	**0.09-0.91**
Highest level of education												
High school degree or less	0.86	0.63-1.17	1.16	0.78-1.73	1.11	0.74-1.67	0.97	0.83-1.15	1.06	0.91-1.23	1.43	0.50-4.05
Associate's or some college	0.94	0.65-1.37	1.19	0.73-1.94	0.57	0.29-1.13	1.02	0.84-1.23	0.98	0.80-1.19	0.80	0.28-2.31
Bachelor's (ref)												
Master's	1.06	0.84-1.35	0.88	0.59-1.31	**0.60**	**0.38-0.94**	0.92	0.79-1.06	0.92	0.79-1.06	0.70	0.34-1.47
Professional or Doctoral Degree	1.04	0.75-1.43	1.03	0.62-1.70	0.99	0.60-1.63	1.13	0.97-1.31	1.02	0.85-1.22	1.08	0.35-3.40
Country of residence United States (ref)												
Europe	**0.48**	**0.26-0.88**	0.49	0.21-1.12	0.66	0.29-1.51	0.91	0.72-1.16	0.77	0.58-1.03	**0.38**	**0.15-0.98**
Canada	0.78	0.49-1.24	0.81	0.41-1.60	1.40	0.80-2.41	0.80	0.59-1.08	0.90	0.70-1.16	0.43	0.15-1.17
Other	0.62	0.37-1.03	0.86	0.47-1.55	**1.84**	**1.18-2.86**	0.10	0.81-1.23	0.92	0.72-1.16	0.90	0.26-3.10
Ethnicity Not Hispanic or Latino (ref)												
Hispanic or Latino	0.98	0.62-1.55	0.88	0.43-1.80	**1.91**	**1.15-3.15**	0.98	0.75-1.27	0.88	0.64-1.19	1.06	0.24-4.63
Race White (ref)												
Other	0.87	0.57-1.33	1.95	1.35-2.84	1.52	0.95-2.45	0.85	0.65-1.10	0.84	0.64-1.09	1.56	0.36-6.71
Number of children 2 (ref)												
3	0.83	0.67-1.02	1.11	0.83-1.50	0.80	0.55-1.16	**0.87**	**0.77-0.98**	**0.82**	**0.71-0.94**	**0.36**	**0.18-0.73**
4	0.77	0.52-1.13	0.89	0.50-1.58	1.05	0.61-1.80	**0.66**	**0.49-0.88**	0.90	0.72-1.12	**0.32**	**0.12-0.87**
5 or more	0.55	0.26-1.18	0.37	0.01-1.41	0.63	0.22-1.81	**0.41**	**0.21-0.79**	0.79	0.52-1.17	**0.16**	**0.05-0.56**
Number of children breastfed beyond 12 months 2 (ref)												
3	0.95	0.76-1.20	1.05	0.75-1.47	1.14	0.79-1.64	**0.86**	**0.74-0.99**	**0.80**	**0.68-0.95**	**0.44**	**0.22-0.86**
4 or more	0.53	0.26-1.08	0.65	0.26-1.61	0.91	0.41-2.04	**0.60**	**0.39-0.91**	0.82	0.59-1.13	**0.27**	**0.09-0.78**

Notes: Odds ratio was used for the partner discussion variable because some cells were too sparse to permit the log-binomial model to run. Total sample size is 699, which is the number of women whose oldest child was a multiple they breastfed for over 12 months. (ref) indicates which category was used as the reference group in the regression model
Missing data: 119 child's healthcare provider, 125 healthcare provider for pregnancy and delivery, 163 primary provider of mother's general healthcare, 141 mother, 149 closest friend, 124 partner

Discussion with Sources of Support in the Mother's Decision to Breastfeed Her Multiples for Over 12 Months

Slightly over half (56.4%) of the women in this sample did not discuss their decision to breastfeed their multiples for beyond 12 months with their child's healthcare provider. Well over half of the women did not discuss their decision with the healthcare provider whom they saw during their pregnancy and for the birth (74.4%) and/ or the primary provider of their own general healthcare (76.7%). Around 70% discussed their decision with their mother and/or their closest friend and 92.2% discussed their decision to breastfeed for more than 12 months with their partner.

Log Binomial Regression/ Logistic Regression to Assess Relationship between Demographics and Discussion with Sources of Support

Women ages 40 – 50 were 1.8 times as likely to discuss their decision to breastfeed over 12 months with the primary provider of their general healthcare as women ages 18 – 29 (CI=1.03-3.13) and they were 0.71 times as likely to discuss their decision with their mothers (CI=0.58-0.86). Additionally, women who were 40 – 50 years old had much lower odds of indicating that they discussed their breastfeeding decision with their partner than women ages 18 – 29 (OR=0.29, CI=0.09-0.91). Women ages 30 – 39 were 14% less likely to talk to their closest friend about their decision as women ages 18 – 29 (CI=0.76-0.97).

In addition to maternal age, there were several other demographic factors compared to discussion of the woman's decision to breastfeed for over 12 months. The second demographic analyzed was the mother's highest level of education. Women with a Master's degree were 40%

less likely to talk to their general practitioner about their breastfeeding decision than women with a Bachelor's (RR= 0.60, CI=0.38-0.94). Women in Europe were 52% less likely to talk to their child's healthcare provider about their breastfeeding decision than women in the United States (RR=0.48, CI=0.26-0.88). Women who selected the 'other' option for country of residence were 1.84 times as likely to discuss their decision with the primary provider of their general healthcare as the reference group (CI=1.18-2.86). Women in Europe had slightly lower odds than women in the US of discussing their breastfeeding decision with their partner (OR=0.38, CI=0.15-0.98). For race and ethnicity, Hispanic women were almost 2 times as likely as non-Hispanic women to discuss their breastfeeding decision with their general care provider (RR= 1.91, CI=1.15-3.15).

Several relationships were found for number of children and number of children breastfed for over 12 months. Women with 3 children were slightly less likely to discuss their decision with their mother than women with 2 children (RR=0.87, CI=0.77-0.98). Women with 4 children were 34% less likely (RR=0.66, CI=0.49-0.88) and women with 5 or more were 59% less likely to discuss their decision with their mother (RR=0.41, CI=0.21-0.79). Women with 3 children were 0.82 times as likely to talk to their closest friend about their breastfeeding decision as the reference group (CI=0.71-0.94). As the number of children a woman has increased, the odds of discussing their decision to breastfeed over 12 months with their partner decreased (3 children: OR= 0.36, CI= 0.18-0.73; 4: OR= 0.32, CI= 0.12-0.87; 5 or more: OR=0.16, CI=0.05-0.56). Women who breastfed 3 children beyond 12 months were slightly less likely to discuss their decision with their mother than women who breastfed 2 children beyond 12 months (RR=0.86, CI=0.74-0.99) and women who breastfed 4 or more children beyond 12 months were 40% less likely to talk to their mothers about their breastfeeding decision than the reference group (RR=0.60, CI=0.39-0.91). Women who breastfed 3 children beyond 12 months were 0.80 times

as likely to talk to their closest friend about their breastfeeding decision than women who breastfed 2 children beyond 12 months (CI=0.68-0.95). The more children a woman breastfed for over 12 months, the lower the odds of talking to their partner about their decision (3 children: OR=0.44, CI=0.22-0.86; 4 or more: OR=0.27, CI=0.09-0.78).

Table 5 Reasons Women Indicated for Choosing Not to Discuss Their Decision to Breastfeed for Over 12 Months with Three Types of Physicians (2016, n=699)

	Child's healthcare provider	**Healthcare provider for pregnancy and delivery**	**Primary provider of mother's general healthcare**
I did not see this healthcare provider around the time that I decided to nurse beyond 12 months of age	––	217 49.2%	213 48.6%
I did not feel comfortable discussing it with my health care provider	13 4.4%	10 2.3%	8 1.8%
I was afraid my healthcare provider would not support my decision	27 9.2%	5 1.1%	12 2.7%
I felt I did not need additional support from my healthcare provider	237 80.6%	197 44.7%	196 44.7%
I do not know or remember	17 5.8%	12 3.2%	9 2.1%
Total	294	441	438
Categories established from 'Other (please specify)' option on the survey			
The topic of my breastfeeding decision did not come up/ I did not set a 12-month goal so there was no decision to discuss	19 24.1%	20 42.6%	5 15.2%
I did not need medical advice on breastfeeding, therefore I felt the topic was not relevant	20 25.3%	7 14.9%	8 24.2%
It was a parenting decision that I did not need to discuss because I did my own research, followed what was natural, or made the decision myself	26 33.0%	12 25.5%	7 21.2%
Other	14 17.7%	8 17.0%	13 39.3%
Total 'other' responses	79	47	33

Notes: Percentages may not add up to 100 because of rounding
Missing: 326 child's healthcare provider, 211 healthcare provider for pregnancy and delivery, 228 primary provider of mother's general healthcare

Reasons Women Indicated for Choosing Not to Discuss Their Decision to Breastfeed for Over 12 Months with Three Types of Physicians

It is important to note that around 50% of women did not see the healthcare provider who took care of them during their pregnancy and delivery or the primary provider of her general healthcare around the time when they decided to breastfeed for over 12 months. Most of the women (80.6%) in the sample felt they did not need any additional support from their child's general practitioner and around 45% felt they did not need any from one or several of the physicians mentioned. Through examining the free responses options, most women indicated that they felt it was their own decision not one for a doctor, it was never mentioned in an appointment with a physician, or it was not relevant either for discussion or to the medical care being received.

Discussion

A majority of the sample who participated in this online survey of women who breastfed their multiples for more than 12 months lived in the United States and included mostly white, non-Hispanic, well-educated women who were between the ages of 30 – 39. Typically, the women had either 2 or 3 children and had breastfeed 2 or 3 total children over 12 months. Factors typically ranked as only somewhat or unimportant in the mother's decision to breastfeed for over 12 months include physician recommendations, family and friend recommendations and ethnic background. Important influences on the mother's decision included partner support, the nutritional and other health benefits of breastfeeding, building a strong bond and the mother and child enjoying breastfeeding. Maternal age and number of children were the demographic characteristics most often associated with factors that influenced their breastfeeding decision.

Younger mothers were more likely to value the nutritional and health benefits of breastfeeding. Women with more than 3 children were significantly more likely to indicate the importance of partner support, as well as the health benefits of breastfeeding and the mother's enjoyment. Breastfeeding being cheaper than formula was more important for younger or less educated women, women from racial or ethnic minority groups, and women with more children. Most women did not discuss their decision with theirs or their child's primary provider of healthcare or the provider for pregnancy and delivery; instead they discussed the decision with their partner, mother, and closest friend. The most common response for why women did not discuss their decision with a physician is that they felt they did not need additional support from that person. Another common reason cited was that the women simply did not visit said provider around the time she made the decision. As the number of children increased, women were less likely to seek support from their mother and their partner. Additionally, older women felt less inclined to discuss their decision with their primary care provider, their mother and their partner. Women in Europe were less likely to talk with their child's healthcare provider and their partner about their decision. Hispanic women were more likely to discuss with their doctor than non-Hispanic women.

Mothers of multiples have breastfeeding initiation rates that are similar to that of singletons. For example, Damato et al. (2005) found that 89.4% of 123 mothers with twins who were part of a national support group for mothers with twins initiated a milk supply via breastfeeding or expressing milk.[3] But only 25% of twin infants and 15% of triplets were still receiving at least some human milk at 6 months, compared to 49.4% of singletons.[1,3] The women in this study breastfed multiples for over 12 months, making them an extremely successful group of breastfeeders. Additionally, with 1,173 women in the sample, it is one of the largest in current

research. The sample provides a unique opportunity to study what factors are important to women who had very successful breastfeeding experiences with multiples.

The majority of women in this study did not discuss their decision to breastfeed for over 12 months with any healthcare provider. The most common reason cited for a woman not discussing with her child's primary care provider was that she did not need additional support. Additional reasons indicated include: it was a parenting decision, rather than one for their doctor, the topic did not come up during an appointment or they did not need medical advice so it was not relevant. Previous research on provider support of mothers with multiples mainly focuses on prenatal counseling and in-hospital breastfeeding support.[18,30] It is possible that mothers feel these sources of in-hospital support are sufficient and do not feel the need to consult a physician about deciding to breastfeed post-discharge. However, some feel that healthcare professionals in hospital settings do not have enough information to assist mothers of multiples, which can lead to passing on of incorrect information and instilling doubt in the mother.[5,10,18,26,31] It is more likely that the mothers in our sample felt they had other sources of support, such as their partner or family. It is also possible that the women got primary care provider support around the time of initiation and not when they decided to breastfeed long-term. Since the survey focused on the woman's decision to breastfeed long-term, and not on whether she discussed breastfeeding difficulties, it is not appropriate to discount provider support for mothers of multiples. Research suggests that physicians do not have adequate knowledge to assist mothers of multiples and this leads to discouragement of attempting to breastfeeding multiple infants.[47] It is encouraging that women in this sample felt they had enough support and information to decide to breastfeed for over 12 months without being influenced by a physician.

Breastfeeding being cheaper than formula was an important factor in the breastfeeding decision of young or less educated women, minorities, and women with more children. Each of these demographic groups is typically associated with lower levels of breastfeeding initiation and duration.[11,21,48,49] This finding is extremely important because it provides a clue as to how to reduce breastfeeding disparities among demographic groups. Breastfeeding interventions targeting minorities, women with lower education, and younger mothers should emphasize the economic benefits of breastfeeding in order to encourage higher rates of initiation and longer durations. There have been several studies done on the national costs of breastfeeding. The USA could save a minimum of $3.6 billion per year in health care and indirect costs if at least 75% of mothers initiated breastfeeding and half of those women breastfed for 6 months.[50,51] Internationally, it is also recognized that low breastfeeding rates have a substantial financial cost.[52–54] In 2017, there was an incentive-based breastfeeding intervention that proved to be successful. Washio et al. conducted a randomized 2-arm parallel group study in which one group of women received monthly financial incentives contingent on breastfeeding for 6 months.[55] Directly paying women to breastfeed may not be the only way cost can influence breastfeeding rates. Future research should determine the impact of emphasizing the cost-effectiveness of breastfeeding over formula on breastfeeding duration. Specific to multiples, this factor is most likely more important than with singletons if parents are trying to save costs with additional children but it seems appropriate to apply to both populations. The estimated cost of formula feeding an infant for one year is between $1,138 and $1,733, though cost may vary depending on infant weight, brand of formula used and country of residence.[56,57] If a woman wants to breastfeeding as well as pump, hospital typically rent pumps for $40 to $65 per month, typically with a deposit required as well as a $50 supply fee.[58] Breastfeeding can incur some additional

costs, largely those associated with pumping supplies, and those costs vary depending on the circumstances and preferences of the mother and child. Overall, it appears that breastfeeding it is more cost effective than formula feeding. Promoting the economic benefits of breastfeeding, in addition to other education resources, may encourage more women to consider breastfeeding, especially in the long-term.

There was an overwhelming response of the importance of the nutritional value of breast milk, the other health benefits associated with breastfeeding, and the bond and enjoyment the mother and child receive from breastfeeding. Several studies on singletons confirm the importance of the nutritional value of breast milk and "breast being best."[33,59] In order to increase breastfeeding rates for mothers of multiples, educational resources and information should emphasis the health and relationship benefits that breastfeeding brings. Though there are not practical guidelines available for mothers of multiples and they often do not receive adequate breastfeeding support, it is important to note that mothers in this survey valued breastfeeding because it provided an enjoyable bond with their child and has many health benefits. Emphasizing the positive outcomes of breastfeeding may encourage mothers of multiples to overcome challenges they face, despite not having clear medical guidelines for them to follow.

A major strength of this study is that it was not done using a convenience sample because much of the current literature on breastfeeding multiples is based on convenience samples or case studies. There was a low portion of the sample that was of Hispanic ethnicity or of a race other than white, but our percentage of minority populations is average or greater than the proportions found in other breastfeeding research, which is typically less geographically diverse as well. The greatest strength of this study is the large sample size (1,173) of women who

breastfed multiples for over a year. The amount of women and the duration of their breastfeeding of multiples provide a unique opportunity to study an under-researched population.

The survey was mainly distributed via the La Leche League (LLL), which may limit the representativeness of the sample and how generalizable the results are for all mothers of multiples. Our survey did not include a question directly asking if the woman was involved in LLL or questions on how much support the group provided. We cannot accurately determine the proportion of women in the sample that were involved in LLL. The effect of this limitation on generalizability cannot be quantified, as we do not have the number of women who were involved in the organization. The advantages of the large, diverse sample of mothers of multiples outweigh the potential drawback from the lack of information about the extent to which the sample is involved in LLL.

Conclusion

The conclusions from this study provide information that can be used in the development of clinical guidelines and interventions to support breastfeeding multiples. Physician support is not important to breastfeeding around 12 months. However, it is possible that they may be influential to certain demographic groups and at the time of breastfeeding initiation. The U.S. Preventative Services Task Force conducted a thorough analysis of breastfeeding interventions in 2016 and states the following – "Primary care clinicians can support women before and after childbirth by providing interventions directly or through referral to help them make an informed choice about how to feed their infants and to be successful in their choice."[60] While physician support before delivery and at initiation were not studied in our survey, it is important to emphasize that physician support does appear to be effective at times other than around one year of age.

Closing gaps in breastfeeding rates that exist between demographic groups could be done by emphasizing breastfeeding being cheap than formula for mothers of multiples. For women with less education, minority ethnic or racial groups, and younger mothers, cost-effectiveness was especially important. These groups of women are categorized as high risk for breastfeeding cessation. Emphasizing the cost savings that can be associated with breastfeeding multiple infants may help to encourage long-term breastfeeding for these demographic groups.

Bonding time with their infants and the nutritional benefits of breastfeeding were found to be most important in a woman's decision to breastfeed long-term. While it is important to establish clinical guidelines to eliminate uncertainty surrounding multiples breastfeeding, it may be equally as important to outline the benefits of breastfeeding for mothers in order to motivate them to overcome any challenges that arise. Motivating a mother by emphasizing the health benefits and bond that breastfeeding provides may be an effective way to encourage more mothers of multiples to breastfeed.

Through research done in the past decade on breastfeeding multiples and the insight this study adds to the field, it is clear that it is important to establish clinical guidelines for mothers of multiples and provide specific interventions to encourage long-term breastfeeding with multiples. The findings from this study indicate that interventions to encourage long-term breastfeeding of multiples could focus on educating women about the health benefits of breastfeeding and emphasize the relationship it can encourage with their children. Additionally, mobilizing a variety of sources of support, from a physician or hospital staff, the woman's partner, and their community, can help to sustain breastfeeding. Improving breastfeeding rates in the United States will have a major positive impact on children's outcomes, including protection from childhood illnesses and promotion of healthy development.[61] Multiples are an especially

important population to improve breastfeeding rates of due to their higher risk of complications, both medically and with the additional support families with multiples may require. With our firm foundation of extensive medical understanding of breastfeeding in singletons, future research should be directed toward catering interventions to families with multiples.

References

1. Centers for Disease Control and Prevention. *Breastfeeding Report Card 2014*.; 2014. http://www.cdc.gov/breastfeeding/pdf/2014breastfeedingreportcard.pdf.
2. Geraghty SR. Human Milk Pumping Rates of Mothers of Singletons and Mothers of Multiples. *J Hum Lact*. 2005;21(4):413-420. doi:10.1177/0890334405280798.
3. Damato EG, Dowling DA, Madigan EA, Thanattherakul C. Duration of Breastfeeding for Mothers of Twins. *J Obstet Gynecol Neonatal Nurs*. 2005;34(2):201-209. doi:10.1177/0884217504273671.
4. Geraghty SR, Khoury JC, Kalkwarf HJ. Comparison of feeding among multiple birth infants. *Twin Res*. 2004;7(6):542-547. doi:10.1375/1369052042663788.
5. Gromada KK, Spangler AK. Breastfeeding Twins and Higher-Order Multiples. *J Obstet Gynecol Neonatal Nurs*. 27(4):441-449. doi:10.1111/j.1552-6909.1998.tb02668.x.
6. Auer C, Gromada Kerkhoff K. A Case Report of Breastfeeding Quadruplets: Factors Perceived as Affecting Breastfeeding. *J Hum Lact*. 1998;14(2):135-141.
7. Szucs K. Quintuplets and a mother's determination to provide human milk: it takes a village to raise a baby--how about five? *J Hum Lact*. 2009;25(1).
8. Damato EG. Explanation for Cessation of Breastfeeding in Mothers of Twins. *J Hum Lact*. 2005;21(3):296-304. doi:10.1177/0890334405277501.
9. Geraghty SR, Pinney SM, Sethuraman G, Roy-Chaudhury A, Kalkwarf HJ. Breast Milk Feeding Rates of Mothers of Multiples Compared to Mothers of Singletons. *Ambul Pediatr*. 2004;4(3):226-231. doi:10.1367/A03-165R1.1.
10. Leonard LG. Breastfeeding Higher Order Multiples: Enhancing Support During the Postpartum Hospitalization Period. *J Hum Lact*. 2002;18(4):386-392. doi:10.1177/089033402237914.
11. Östlund Å, Nordström M, Dykes F, Flacking R. Breastfeeding in Preterm and Term Twins—Maternal Factors Associated With Early Cessation: A Population-Based Study. *J Hum Lact*. 2010;26(3):235-241.
12. Ogbuanu C, Glover S, Probst J, Hussey J, Liu J. Balancing Work and Family: Effect of Employment Characteristics on Breastfeeding. *J Hum Lact*. 2011;27(3):225-238.

doi:10.1177/0890334410394860.

13. Segal NL. Population-based research: breastfeeding multiple birth infants/twin research reviews and news: perceived aging in twins; separation of conjoined twins; school placement legislation/twins in education, fashion and humanitarian events. *Twin Res Hum Genet*. 2010;13(2):217-220. doi:10.1375/twin.13.2.217.

14. Purdy IB. Social, cultural, and medical factors that influence maternal breastfeeding. *Issues Ment Health Nurs*. 2010;31(5):365-367. doi:10.3109/01612840903359757.

15. Breastfeeding in Sheffield. Breastfeeding in Public. http://www.breastfeedinginsheffield.co.uk/mum-and-baby/breastfeeding-in-public/.

16. Regional Attitudes toward Breastfeeding.

17. Anderson T. Diet and breastfeeding. *Can Nurse*. 1997;93(2):6. http://search.ebscohost.com/login.aspx?direct=true&db=c8h&AN=1997016252&site=ehost-live&scope=site.

18. Cinar ND, Alvur TM, Kose D, Nemut T. Breastfeeding Twins: A Qualitative Study. *J Heal Popul Nutr*. 2013;31(4):504-509. doi:10.3329/jhpn.v31i4.20049.

19. Leonard LG. Breastfeeding Rights of Multiple Birth Families and Guidelines for Health Professionals. *Twin Res Hum Genet*. 2003;6(1):34-45.

20. Yokoyama Y, Ooki S. Breast-feeding and Bottle-feeding of Twins, Triplets and Higher Order Multiple Births. *Japanese J Public Heal*. 2004;51(11):969-974.

21. Yokoyama Y, Wada S, Sugimoto M, Katayama M, Saito M, Sono J. Breastfeeding rates among singletons, twins and triplets in Japan: A population-based study. *Twin Res Hum Genet*. 2006;9(2):298-302. doi:10.1375/183242706776382347.

22. Mead L. Breastfeeding Success With Preterm Quadruplets. *J Obstet Gynecol Neonatal Nurs*. 21(3):221-227.

23. Leonard LG. Breastfeeding Triplets: The At-Home Experience. *Public Health Nurs*. 2000;17(3):211-221. doi:10.1046/j.1525-1446.2000.00211.x.

24. Odom EC, Li R, Scanlon KS, Perrine CG, Grummer-Strawn L. Reasons for Earlier Than Desired Cessation of Breastfeeding. *Pediatrics*. 2013;131(3):e726-e732. doi:10.1542/peds.2012-1295.

25. Liang R. Can preterm twins breast feed successfully? *N Z Med J*. 1997;110(1045).

26. Kavanaugh K. Getting enough: mothers' concerns about breastfeeding a preterm infant after discharge. *J Obstet Gynecol neonatal Nurs JOGNN*. 1995;24(1).

27. Kirchner L, Jeitler V, Waldhör T, Pollak A, Wald M. Long hospitalization is the most important risk factor for early weaning from breast milk in premature babies. *Acta Paediatr Int J Paediatr*. 2009;98(6):981-984. doi:10.1111/j.1651-2227.2009.01248.x.

28. Hedberg Nyqvist K. Breast-feeding in Preterm Twins: Development of Feeding Behavior and Milk Intake During Hospital Stay and Related Caregiving Practices. *J Pediatr Nurs*. 2002;17(4):246-256.

29. Flidel-Rimon O, Shinwell E. Breast Feeding Twins and High Multiples. *Arch Dis Child Fetal Neonatal Ed*. 2006;91(5):377-380.

30. Hattori R, Hattori H. Breastfeeding Twins: Guidelines For Success. *Birth*. 1999;26(1):37-42.

31. Meier P. Breastfeeding in the Special Care Nursery. Prematures and Infants With Medical Problems. *Pediatr Clin North Am*. 2001;48(2):425-442.

32. Kuhnly J. The Development and Implementation of a Prenatal Education Program for Expectant Parents of Multiples. *J Perinat Educ*. 2015;24(2).

33. Arora S, McJunkin C, Wehrer J, Kuhn P. Major Factors Influencing Breastfeeding Rates: Mother's Perception of Father's Attitude and Milk Supply. *Pediatrics*. 2000;106(5).

34. Kramer MS, Chalmers B, Hodnett ED, et al. Promotion of Breastfeeding Intervention Trial (PROBIT). *J Am Med Assoc*. 2001;285(4):413. doi:10.1001/jama.285.4.413.

35. Sikorski J, Renfrew MJ, Pindoria S, Wade A. Support for breastfeeding mothers: a systematic review. *Paediatr Perinat Epidemiol*. 2003;17(4):407-417. http://www.ncbi.nlm.nih.gov/pubmed/14629324. Accessed December 23, 2016.

36. McKeever P, Stevens B, Miller K-L, et al. Home versus hospital breastfeeding support for newborns: a randomized controlled trial. *Birth*. 2002;29(4):258-265. http://www.ncbi.nlm.nih.gov/pubmed/12431265. Accessed December 23, 2016.

37. Friedman S. The effect of prenatal consultation with a neonatologist on human milk feeding in preterm infants. *Acta Paediatr*. 2004;93(6).

38. Gromada K. Full-term (or almost full-term) healthy twins or triplets □. 2016.

39. Kuhnly J. Strategies to Support Sustained Breastfeeding of Late Preterm Multiple Birth Infants. *Nurs Women's Heal*. 2015;19(5).

40. Biancuzzo M. Breastfeeding Preterm Twins: A Case Report. *Birth*. 21(2):96-100. doi:10.1111/j.1523-536X.1994.tb00241.x.

41. Oras P, Thernström Blomqvist Y, Hedberg Nyqvist K, et al. Skin-to-skin contact is associated with earlier breastfeeding attainment in preterm infants. *Acta Paediatr*. 2016;105(7):783-789. doi:10.1111/apa.13431.

42. McGovern T. The challenges of breastfeeding twins. *Nurs N Z*. 2014;20(11).

43. Bennington LK. Breastfeeding Multiples: It Can Be Done. *Newborn Infant Nurs Rev*. 2011;11(4):194-197.

44. Hamilton BE, Martin JA, Osterman MJKS, Curtin SC, Mathews TJ. National Vital

Statistics Reports, Volume 64, Number 12, December 23, 2015. 2014.

45. Multiple Births Statistics | Multiples of America. http://www.multiplesofamerica.org/research/multiple-births-statistics/. Accessed December 20, 2016.

46. WHO | Breastfeeding. *WHO*. 2016.

47. Radzyminski S, Callister LC. Health Professionals' Attitudes and Beliefs About Breastfeeding. *J Perinat Educ*. 2015;24(2):102-109. doi:10.1891/1058-1243.24.2.102.

48. Mckinney CO, Hahn-Holbrook J, Lindsay Chase-Lansdale P, et al. Racial and Ethnic Differences in Breastfeeding. *Pediatrics*. 2016;138(2).

49. Sparks PJ. Racial/Ethnic Differences in Breastfeeding Duration among WIC-Eligible Families. 2011. doi:10.1016/j.whi.2011.03.002.

50. United States Government Accountability Office. *Breastfeeding: Some Strategies Used to Market Infant Formula May Discourage Breastfeeding*.; 2006.

51. Kent G. International Breastfeeding Journal WIC's promotion of infant formula in the United States. doi:10.1186/1746-4358-1-8.

52. Pokhrel S, Quigley MA, Fox-Rushby J, et al. Potential economic impacts from improving breastfeeding rates in the UK. doi:10.1136/.

53. Rouw E, Hormann E, Scherbaum V. The high cost of half-hearted breastfeeding promotion in Germany. *Int Breastfeed J*. 2014;9(1):22. doi:10.1186/s13006-014-0022-5.

54. Piwoz EG, Huffman SL. The Impact of Marketing of Breast-Milk Substitutes on WHO-Recommended Breastfeeding Practices. doi:10.1177/0379572115602174.

55. Washio Y, Humphreys M, Colchado E, et al. Incentive-based Intervention to Maintain Breastfeeding Among Low-income Puerto Rican Mothers. *Pediatrics*. 2017.

56. Cost of Formula Feeding - The Breastfeeding Center of Ann Arbor. http://bfcaa.com/cost-of-formula-feeding/. Accessed February 22, 2017.

57. How Much Money Does Breastfeeding Really Save? - The Simple Dollar. http://www.thesimpledollar.com/how-much-money-does-breastfeeding-really-save/. Accessed February 22, 2017.

58. Cost of a Breast Pump - Child Care and Expenses - CostHelper.com. http://children.costhelper.com/breast-pump.html. Accessed February 22, 2017.

59. Earle S. Factors affecting the initiation of breastfeeding: implications for breastfeeding promotion. *Health Promot Int*. 2002;17(3):205-214. doi:10.1093/heapro/17.3.205.

60. Bibbins-Domingo K, Grossman DC, Curry SJ, et al. Primary Care Interventions to Support Breastfeeding. *JAMA*. 2016;316(16):1688. doi:10.1001/jama.2016.14697.

61. WHO | 10 facts on breastfeeding. *WHO*. 2015.

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